

HR-347 Impacts on Safety of Left Turn Treatment at High Speed Intersections

Key Words: Traffic Safety, Intersections, Traffic Planning

Abstract

Left-turning traffic is a major source of conflicts at intersections. Though an average of only 10 percent to 15 percent of all approach traffic turns left, these vehicles are involved in approximately 45 percent of all accidents.

This report presents the results of research conducted to develop models which estimate approach accident rates at high speed signalized intersections. The objective of the research was to quantify the relationship between traffic and intersection characteristics, and accident potential of different left turn treatments.

Geometric, turning movement counts, and traffic signal phasing data were collected at 100 intersections in Iowa using a questionnaire sent to municipalities. Not all questionnaires resulted in complete data and ultimately complete data were derived for 63 intersection providing a database of 248 approaches. Accident data for the same approaches were obtained from the Iowa Department of Transportation Accident Location and Analysis System (ALAS). Regression models were developed for two different dependent variables; 1) the ratio of the number of left turn accidents per approach to million left turning vehicles per approach, and 2) the ratio of accidents per approach to million traffic movements per approach.

A number of regression models were developed for both dependent variables. One model using each dependent variable was developed for intersections with low, medium, and high left turning traffic volumes.

As expected, the research indicates that protected left turn phasing has a lower accident potential than protected/permitted or permitted phasing. Left turn lanes and multiple lane approaches are beneficial for reducing accident rates, while raised medians increase the likelihood of accidents. Signals that are part of a signal system tend to have lower accident rates than isolated signals.

The resulting regression models may be used to determine the likely impact of various left turn treatments on intersection accident rates. When designing an intersection approach, a traffic engineer may use the models to estimate the accident rate reduction as a result of improved lane configurations

and left turn treatments. The safety benefits may then be compared to any costs associate with operational effects to the intersection (i.e., increased delay) to determine the benefits and costs of making intersection safety improvements.